(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 421 025 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
06.05.1999 Bulletin 1999/18

(51) Int Cl.[6]: **G06F 3/033**

(21) Application number: **89202473.8**

(22) Date of filing: **02.10.1989**

(54) Data processing system with a touch screen and a digitizing tablet, both integrated in an input device

Datenverarbeitungssystem mit einer Berührungsanzeige und einem Digitalisiertablett, beide integriert in einer Eingabevorrichtung

Système de traitement des données avec une surface tactile et une tablette à numériser, les deux intégrées dans un dispositif d'entrée

(84) Designated Contracting States:
CH DE ES FR GB IT LI SE

(43) Date of publication of application:
10.04.1991 Bulletin 1991/15

(73) Proprietor: **Koninklijke Philips Electronics N.V.**
5621 BA Eindhoven (NL)

(72) Inventor: **Duwaer, Arne Lex**
NL-5656 AA Eindhoven (NL)

(74) Representative:
Groenendaal, Antonius Wilhelmus Maria et al
INTERNATIONAAL OCTROOIBUREAU B.V.,
Prof. Holstlaan 6
5656 AA Eindhoven (NL)

(56) References cited:
EP-A- 0 025 282
EP-A- 0 206 508
EP-A- 0 256 327
EP-A- 0 297 557
US-A- 4 655 552
US-A- 4 686 332
US-A- 4 772 763

- **I &CS, vol. 62, no. 2, February 1989, pages 61-64, Radnor, PA, US; W. WEHRER: "The right touch for control"**

EP 0 421 025 B1

Description

[0001] The invention relates to a data processing system with an input device according to the preamble part of Claim 1.

[0002] A system incorporating both a touch screen and a digitizing tablet as specified in the preamble is known from American patent US 4,686,332. The known system has a data display means comprising a viewing surface, above which a grid of conductors is placed, forming a touch screen medium and a digitizing tablet medium. It is a disadvantage of the known system that the digitizing tablet, the touch screen and data display means have reduced quality as a result of the particular way of integration.

[0003] It is therefore an object of the invention to provide a data processing system as specified in the preamble in which the display device, the touch screen and the digitizing tablet have better performance.

[0004] A data processing system according to the invention is therefore characterized by the features recited in the characterizing part of Claim 1. Each part of the input device, either the touch screen or the digitizing tablet, responds to a physically different stimulus. For instance, the touch screen part is activatable by detecting the absorption of surface acoustic waves and the digitizing tablet is activatable by detecting induction currents generated by the stylus. Or the touch screen operates only on the reaction forces and moments in the screen's suspension, while the digitizing tablet reacts only to ultrasonic waves emitted by the stylus. The physical character (or dimension) of the stimulus therefore is the discriminating factor in this realization. Alternatively, the stimuli for activating both the touch screen and the digitizing tablet are of a same physical character (or dimension) but can be accorded different values within a parameter space.

[0005] At this point it will be clear for the man skilled in the art that a plurality of combinations of touch screen and a digitizing tablet both integrated within a same compact input device will be possible, dependent on the screen's and the tablet's activation mechanisms or accessability in view of their position relative to each other.

[0006] The touch screen and the digitizing tablet can be integrated contiguously within substantially a same area of the top surface of the input device. The touch screen and the digitizing tablet need not be coplanar. For instance, the touch screen part may be integrated in a raised border of the input device under a substantial angle with the plane digitizing tablet for ergonomic reasons. Also the touch screen and the digitizing tablet may occupy areas of substantially different proportions. In another embodiment the touch screen and the digitizing tablet are stacked permitting the input device to have limited dimensions.

[0007] An example of a data display means is a liquid crystal display (LCD). In an LCD the polarization of light by liquid crystals can be varied under control of an electric field, giving rise to the modulation of the amount of light transmitted when appropriate polarizers are used. In view of the relatively low power dissipation and of the relatively low cost price, the LCD prevails over the other types. A suitable LCD for integration with the touch screen and the digitizing tablet may be the Twisted Nematic LCD, with an active matrix with a switching element (e.g. a transistor or a diode-ring) for each pixel, the Super Twisted Nematic LCD without an active matrix, or a Ferro-Electric LCD comprising a memory inherent in the display itself.

[0008] Preferably, the data processing system according to the invention comprises mouse means coupled to the input device in order to enable all current ways of data entry. For instance, the "mouse" is operated via the touch screen by indirect pointing, that is by touching with a finger a particular sector of a segmented compass-card that is shown on the touch screen resulting in relative displacements of the cursor, or via the digitizing tablet by direct pointing and cursor control for dragging. Thus, the invention provides a data processing system that is compact, portable, and multifunctional with respect to data entry.

[0009] Preferably, in case at least the touch screen or the digitizing tablet is activatable in an electrical way, the input device comprises a conductive sheet at a fixed potential for protecting the touch screen or the digitizing tablet against electromagnetic radiation originating in the control circuitry of the data processing system, for instance due to the control of the display. In a stacked embodiment there may be provided a transparent conductive layer between the digitizing tablet and the touch screen on the one hand and the radiating circuitry part of the display on the other hand.

[0010] Various embodiments of an input device comprising particular combinations of a touch screen, a digitizing tablet and a flat panel display for use in a data processing system according to the invention will be illustrated by way of non-limitative examples with reference to the drawing in which:

Figure 1 gives a first diagrammatic example of an input device containing as integral parts thereof: a touch screen based on the use of surface acoustic waves, a digitizing tablet based on a capacitive coupling between the tablet and an appropriate stylus, and an LCD, as a display,

Figure 2 shows a second diagrammatic example using a touch screen and a display as in Figure 1 and comprising a digitizing tablet based on localizing the position of an appropriate stylus by a cross bearing of ultrasonic waves,

Figure 3 shows a third diagrammatic example employing a touch screen that registers the forces and movements in the suspension of the screen for determining a place of contact, and a digitizing tablet integrated on a surface of an LCD, the tablet's operation being based on ultrasonic-wave-cross-

bearing,

Figure 4 discloses a fourth diagrammatic example of an input device employing a touch screen and a digitizing tablet, both based on a capacitive coupling with the input device, while using a force-threshold for determining the activation of the touch screen,

Figure 5 shows a fifth diagrammatic example of an input device wherein the display is sandwiched between the touch screen and the digitizing tablet.

[0011] Throughout the Figures same reference numerals will designate identical or corresponding parts.

[0012] In Figure 1 there is shown a first diagrammatic example of an input device for use in a data processing system according to the invention. The input device comprises a layered structure with a touch screen 10 at the top, a digitizing tablet 12 in the middle and a liquid crystal display (LCD) 14 at the bottom. For clarity the components constituting the layered structure have been drawn spaced out. In practice, the structure is a compact laminated device. The touch screen 10 operates on the basis of surface acoustic waves (SAW), radiated by transmitters 16 and 18 into the front panel 20, constituting the top surface of the input device, along respective series of reflective elements 22 and 24 in order to spread the transmitted waves across the panel 20. The panel is further provided with receivers 26 and 28 that receive the waves after they have been reflected by respective other series of reflective elements 30 and 32. A SAW-pulse transmitted by transmitters 16 or 18 will be received retarded and broadened by receivers 26 or 28. In case a soft tissue, like the user's finger 34, contacts the panel 20, some of the energy of the SAW pulse will be absorbed by the tissue, resulting in a decreased amplitude of the pulse components 36 and 38 passing through the location of contact 40. The moment of the receipt of said reduced components, related to the moment of transmission, is indicative of the momentary position 40 at which the absorption occurs. In order to avoid mutual interference, transmitters 16 and 18 may transmit alternatingly.

[0013] The digitizing tablet 12 is situated below touch screen 10 . The tablet 12 comprises an electrically resistive homogeneous sheet 42 of a transparent, electrically conductive substance, for instance Indium-Tin-oxide. Along its circumference, sheet 42 is provided with a plurality of series of highly conductive, uniformly distributed electrodes 44, 46, 48 and 50 for establishing electrical contacts with the resistive sheet 42. Each series of electrodes is connectable to or disconnectable from an associated conductor 52, 54, 56 and 58, by means of an associated series of switches 60, 62, 64 and 66. The switches 60 and 64 are operated simultaneously. Also the switches 62 and 66 are operated simultaneously. The pairs of switches 60/64 and 62/66 are connected alternatingly with their associated conductors 52/56 and 54/58, respectively. This basic arrangement may be used in various ways.

[0014] In a first appliance the stylus 68 may comprise a source for generating electromagnetic radiation that couples capacitively with sheet 42 and an area 70 through panel 20 for thereupon inducing currents in sheet 42. These currents will spread over sheet 42 and will be gathered by conductors 52/56 or 54/58 at zero potential, that have been connected to sheet 42. Now, the current in each conductor is indicative of the aggregated resistance between area 70 and the relevant conductor. Since the sheet is homogeneous, this aggregated resistance is a quantity that corresponds with a respective distance between an area 70 and the respective conductor. Therefore, by sensing the aggregated currents in both pairs of conductors connected to sheet 42 the area 70 can be accorded coordinates that correspond to the stylus, 68 momentarily position. For sensing the aggregated currents each conductor that is connected to sheet 42 is coupled with a detector (not shown) which may contain: a current-to-voltage converter operating at zero potential ("virtual ground"), an amplifier, an ac-to-dc converter, an analog-to-digital converter and a microcontroller with appropriate software for calculating the coordinates and for possibly adjusting for any deviation between calculated coordinates and physical position of the stylus 68 due to the particular embodiment of the shown input device.

[0015] In a second appliance a time-varying electromagnetic field is established across sheet 42 which field has a local phase that is indicative of a position within the field. To this end conductors 54 and 58 may supply synchronously varying simple harmonic voltages to sheet 42, which voltages have a predetermined mutual phase difference, like for instance a sine and a cosine time-dependence. By first sensing the phase by a probe (not shown) in stylus 68 while conductors 54 and 58 are active, and then sensing the phase by the probe in stylus 68 when conductors 52 and 56 carry the time-dependent voltages, the location of the stylus can be derived from the registered phases.

[0016] The digitizing tablet 12 is disposed on top of a flat panel display 14 of the LCD type. As both the touch screen 10 and the digitizing tablet 12 are transparent, the display 14 can be viewed through these devices, for instance in order to create a visual feedback towards the user while writing or drafting with stylus 68 within the range of digitizing tablet 12 or in order to select data to be processed on the basis of information shown on LCD 14 by touching touch screen 10 at a predetermined position associated with said data.

[0017] As has been stated above the figure presents an exploded view of a data input device for use in a data processing system according to the invention. The layered structure may in practice be realized as a very compact device, for instance by using the upper surface of a same panel 20 for depositing a pattern thereupon constituting the reflective elements 22, 23, 38 and 32, and by using the downfacing surface for depositing thereup-

on a layer of resistive material constituting sheet 42 preferably of Indium-Tin-oxide for its transparency. In another embodiment the features constituting the reflective elements 22, 24, 30 and 32 and the sheet 42 may be integrated within one of the polarizers 140 of an LCD, the reflective elements at the one surface for accessability, the resistive sheet 42 at the other surface of the respective polarizer. In a further embodiment the digitizing tablet 12 and the touch screen 10 each may comprise a separate associated panel like panel 20 in view of convenient manufacturing said devices.

[0018] Since both the touch screen 10 and the digitizing tablet 12 utilize different activation mechanisms, (the touch screen 10 is activated mechanically, the digitizing tablet 12 is activated electrically) the input data transferred into the data processing system via the input device shown in Figure 1 are distinguishable. In order to feed input data selectively into the data processing system, the system may be provided with a selection-switch to enable either the touch screen 10 or the digitizing tablet 12. In the alternative, stylus 68 may incorporate either a (piezo-ceramic) pressure sensor with appropriate processing or simply a pressure-sensitive switch for turning-off the touch screen 10 and turning on the digitizing tablet 12 upon contacting the surface of the input device.

[0019] In Figure 2 a second example is shown of an input device for use in a data processing system according to the invention. The digitizing tablet 12 and the touch screen 10 now both have been integrated on one of the polarizers 140 of LCD 14 . The touch screen 10 is of the surface-acoustic-wave type already described with reference to Figure 1. At the same surface the digitizing tablet 12 is realized, the operation thereof being based upon ultrasonic waves propagating across the polarizer in the air. The surface is provided with two ultrasonic receivers 90 and 92 for determining the position of a source of ultrasonic pulses at the tip 94 of stylus 68, for instance by means of cross-bearing. Preferably, more than two ultrasonic receivers are employed in order to ensure that position decoding is always possible in spite of the presence of the user's hand that may obstruct the ultrasonic waves.

[0020] Figure 3 discloses an input device wherein the operation of the touch screen part 10 employs the registering of the reaction forces and -moments in the suspension of the device and wherein the digitizing tablet 12 uses the capacitive coupling between the tablet and a special stylus as has been described previously with reference to Figure 1. The touch screen part is established by suspending the LCD 14 by four elastic devices 104, 106, 108 and 110, that are attached to a rigid frame 112. Each elastic device comprises a strain gauge, for instance a piezo resistive strain gauge printed on an aluminum substrate, like gauges 114, 116, 118 and 120. Each gauge incorporates several resistances that, for example, are connected in Wheatstone bridge configurations (not shown) in order to derive from the various reaction-forces and - movements in the suspension, occurring when an external force is applied to the upper surface of the input device, the location whereto the external force is applied.

[0021] Filter means may be provided for filtering out reaction forces and moments, that are due to the input device's inertia when it is moved and therefore bear no relation with any intended activation. For instance, the filter means may be realized in software for discriminating signals that have predetermined characteristics representing an intended activation by touching the input device with a finger or a stylus in a specified, ergonomic way.

[0022] The use of the gauges may be restricted to measure the force in order to compare it with a threshold for ergonomic reasons. This will be clarified by way of Figure 4, which is similar to the previous Figure 3 to a large extent. Now, the homogeneous electrically resistive sheet 10 and 12 plays a part in both the digitizing tablet 12 and the touch screen 10. In order to function as a touch screen for being activated by the proximity of finger 130, appropriate electronic circuitry (not shown) is provided for detecting a capacitive coupling from sheet 10 and 12 towards earth via finger 130 and for thereupon deriving the finger's 130 position. This item is well known in the art. In order to function as a digitizing tablet cooperating with stylus 68, other appropriate electronic circuitry (not shown) is incorporated for determining the stylus' 68 momentary position in the way as has already been described with reference to Figure 1. In this particular embodiment the stimuli that represent the finger's 130 touch or the presence of stylus 68 for activating the touch screen part or the digitizing table part, respectively, are of a same physical character (a signal detected capacitively).

[0023] The aggregated force measured by the gauges 114, 116, 118 and 120 is compared with a threshold by a comparator (not shown) for determining when the touch screen should be activated. Preferably, the threshold corresponds with a force of 60-80 gram associated with the pressing of a key in a conventional alphanumerical keyboard of a typewriter. Only when the applied force exceeds the predetermined threshold the touch screen will be activated. Therefore, the use of gauges makes an adjustment of the touch screen part possible with respect to the required force to be applied for activating the touch screen.

[0024] Within this context it should be mentioned that the use of gauges as a touch-force thresholding means may be of particular advantage for ergonomic reasons in respect of a tactile feedback when employing a touch screen of the kind that does not require an actual contact for activation, for instance the capacitive touch screen discussed above and the touch screen based on obstructing light beams that form a grid in front of a front panel.

[0025] In all examples given thus far, the digitizing tablet part had to be transparent because of its location

above the top surface. An example wherein the transparency of the tablet is irrelevant is shown in Figure 5.

[0026] Figure 5 discloses the LCD 14 to have a polarizer 140 forming an isolating panel as a part of the digitizing tablet 12. The touch screen part 10 is integrated on the upper surface of the polarizer 140 of LCD 14. The digitizing tablet part 12 has been realized with non-transparent conductors 80, 82 on a non-transparent sheet 152. By manipulating a stylus 68 having a tip 84 that radiates electromagnetic waves, inductive currents occur in the loops 80 and 82 that overlap the projection onto the digitizing tablet 12 of an area at the surface of the input device, in which area the stylus tip 84 is maintained. By sensing those inductive currents the momentary location of the stylus' tip 84 is determined.

[0027] The loops 80 and 82 can be made of for instance Cu or Ag. The specific conductivity of these materials is higher than that of Indium-Tin-Oxide and consequently gives rise to a higher sensitivity and accuracy of the digitizing tablet. This structure can be employed when the display 14 is passive (requiring no additional back-lighting), reflective and (preferably) thin.

The stylus is provided with a pressure sensitive switch at tip 84 for radiating only when contacting the surface of the input device upon sensing a pressure exceeding a predetermined threshold. As in Figure 1 input data are discriminated on the basis of the different physical characters of the stimuli, the touch screen 10 being susceptible to mechanically draining the energy of the surface acoustic waves, the digitizing tablet being activated electrically by inducing currents in sets of crossing loops.

Claims

1. Data processing system comprising an input device, the input device comprising:

   a touch screen for inputting data into the system, the touch screen comprising a touch screen medium and a first detector susceptible of a first stimulus in the touch screen medium, the first stimulus being representative of a touch;
   a digitizing tablet for inputting data into the system by means of manipulating a stylus near the tablet, the digitizing tablet comprising a digitizing tablet medium and a second detector susceptible of a second stimulus in the digitizing tablet medium, the second stimulus being representative of a presence of the stylus;
   said touch screen and said digitizing tablet being integrated with a display screen in that they have substantially overlapping user areas,
   characterized in that said first and second stimuli are discriminatable either on the basis of their mutually different physical dimensions, or on the basis of their mutually disjunct value ranges,
   in that the touch screen medium is located at the user side of said display screen and is free of transparency jumps across its user area,
   in that the digitizing tablet medium is either located at the user side of said display screen and is free of transparency jumps across its user area,
   or is located opposite the user side from said display screen,
   and in that the stylus incorporates a pressure sensor for under control of a pressure exceeding a predetermined threshold enabling a cooperation between the stylus and the input device.

2. Data processing system as claimed in Claim 1, wherein the touch screen comprises:

   - source means for transmitting surface acoustic waves across the touch screen medium
   - receiver means for receiving the surface acoustic waves;
   - processing means coupled to the receiver means for on the basis of an absorption of the surface acoustic waves in the touch screen medium determining a presence and a location of the absorption as caused by the touch.

3. Data processing system as claimed in Claim 1, wherein the touch screen comprises:

   - a resistive layer;
   - means for determining a location of a capacitive coupling between the resistive layer and ground as caused by the touch.

4. Data processing system as claimed in Claim 1, wherein the touch screen comprises:

   - a rigid surface coupled to a rigid frame by means of stress or strain sensitive elements;
   - means for upon monitoring the stress or strain in the elements determining if and where an external force is applied to the rigid surface by the touch.

5. Data processing system as claimed in Claim 4, wherein filter means are provided for discriminating the stress or strain that is due to the intended activation of the input device by the touch as contrasted with the stress or strain due to the input device's inertia when it is moved.

6. Data processing system as claimed in Claim 1, wherein the touch screen comprises:

   - grid means for generating a grid of light beams

above and parallel to the top surface;
- detection means for upon detecting an obstruction of at least one light beam as caused by the touch, processing data associated with the particular beam as an indication of a position of the obstruction.

7. Data processing system as claimed in Claim 1, 2, 3, 4, 5 or 6, wherein the digitizing tablet comprises:

- a resistive layer;
- means for establishing a time-dependent electromagnetic field across the resistive layer which electromagnetic field has a phase or amplitude that is dependent on a position in the field, the stylus being provided with a detector sensitive to the electromagnetic field;
- processing means coupled to said detector for upon sensing the electromagnetic field, determining a location of the stylus with respect to the input device.

8. Data processing system as claimed in Claim 1, 2, 3, 4, 5 or 6, wherein the digitizing tablet comprises:

- a resistive layer, the stylus being provided with source means for inducing currents in the resistive layer;
- sensing means for sensing aggregated currents flowing in two anti-parallel directions across the resistive layer;
- processing means coupled with the sensing means or upon sensing the aggregated currents, determining a location of the stylus with respect to the input device.

9. Data processing system as claimed in Claim 1, 2, 3, 4, 5 or 6, wherein the digitizing tablet comprises:

- a first layer comprising a first set of conductors in a first orientation;
- a second layer parallel to the first layer, comprising a second set of conductors in a second orientation electrically isolated from the first set, the stylus being provided with source means for generating inductive currents in said sets of conductors;
- sensing means for sensing the inductive currents;
- processing means coupled to said sensing means for sensing the inductive currents determining a location of the stylus with respect to the input device, and wherein the data display means comprises a passive, reflective liquid crystal display, the digitizing tablet being disposed underneath an active portion of the liquid crystal display.

10. Data processing system as claimed in Claim 1, the input device being suspended by means of stress or strain sensitive elements for detecting an external force applied to the input device, comparator means being provided for comparing the applied force with a predetermined threshold, for in case of exceeding the threshold activating the input device.

11. Data processing system as claimed in Claim 1, wherein at least the touch screen or the digitizing tablet is electrically activatable, there being provided a conductive sheet at a predetermined potential for protecting the touch screen or the digitizing tablet against electromagnetic radiation originating in control circuitry of the data processing system.

12. Data processing system as claimed in Claim 1, characterized in that the data processing system is provided with mouse means for displaying a cursor to be operated via at least the touch screen or the digitizing tablet either by pointing to and pressing on a relevant location for repositioning the cursor or by pointing to a segmented compass-card with virtual "click"-buttons, a segment of the compass-card being indicative of a direction of movement of the cursor upon activation of the segment.

Patentansprüche

1. Datenverarbeitungssystem mit einer Eingabeeinrichtung, wobei diese Eingabeeinrichtung die nachfolgenden Elemente aufweist:

- einen Berührungsschirm zum Eingeben von Daten in das System, wobei dieser Berührungsschirm ein Berührungsschirmmittel und einen ersten Detektor aufweist, der empfindlich ist für einen ersten Stimulus in dem Berührungsschirmmedium, wobei dieser erste Stimulus repräsentativ ist für eine Berührung;
- ein Digitalisierungstablett zum Eingeben von Daten in das System durch Manipulation eines Schreibstiftes in der Nähe des Tabletts, wobei das Digitalisierungstablett ein Digitalisierungstablettmedium und einen zweiten Detektor aufweist, der empfindlich ist für einen zweiten Stimulus in dem Digitalisierungsmedium, wobei der zweite Stimulus repräsentativ ist für einen vorhandenen Schreibstift;
- wobei der genannte Berührungsschirm und das genannte Digitalisierungstablett mit einem Wiedergabeschirm derart integriert sind, dass sie wesentlich überlappende Gebrauchergebiete haben,

dadurch gekennzeichnet,

- dass der genannte erste und zweite Stimulus entweder auf Basis deren gegenseitiger verschiedener physikalischer Größen detektierbar sind, oder auf Basis deren gegenseitiger verschiedener Wertbereiche,
- dass das Berührungsschirmmedium auf der Gebraucherseite des genannten Wiedergabeschirms vorgesehen ist und keine Transparenzsprünge über das Gebrauchergebiet aufweist,
- dass das Digitalisierungstablettmedium entweder auf der Gebraucherseite des genannten Wiedergabeschirms liegt und keine Transparenzsprünge über das Gebrauchergebiet aufweist, oder gegenüber der Gebraucherseite an dem genannten Wiedergabeschirm liegt, und
- dass der Schreibstift einen Drucksensor aufweist zum unter Ansteuerung eines eine vorbestimmte Schwelle übersteigenden Drucks, Freigeben einer Zusammenarbeit zwischen dem Schreibstift und der Eingabeeinrichtung.

2. Datenverarbeitungssystem nach Anspruch 1, wobei der Berührungsschirm die nachfolgenden Elemente aufweist:

   - Quellenmittel zum Aussenden akustischer Oberflächenwellen über das Berührungsschirmmedium,
   - Empfangsmittel zum Empfangen der akustischen Oberflächenwellen;
   - Verarbeitungsmittel, die mit den Empfangsmitteln gekoppelt sind um auf Basis einer Absorption der akustischen Oberflächenwellen in dem Berührungsschirmmedium das Vorhandensein und die Lage der durch die Berührung verursachten Absorption zu bestimmen.

3. Datenverarbeitungssystem nach Anspruch 1, wobei der Berührungsschirm die nachfolgenden Elemente aufweist:

   - eine Widerstandsschicht;
   - Mittel zur Bestimmung einer Stelle einer kapazitiven Kopplung zwischen der Widerstandsschicht und Erde, verursacht durch die Berührung.

4. Datenverarbeitungssystem nach Anspruch 1, wobei der Berührungsschirm die nachfolgenden Elemente aufweist:

   - eine starre Oberfläche, die mit Hilfe von spannungs- oder dehnungsempfindlichen Elementen mit einem starren Rahmen gekoppelt ist
   - Mittel zum durch Überwachung der Spannung oder der Dehnung in den Elementen Bestimmen, ob und wo eine externe Kraft durch Berührung auf die starre Oberfläche ausgeübt wird.

5. Datenverarbeitungssystem nach Anspruch 4, wobei Filtermittel vorgesehen sind zum Diskriminieren der Spannung oder der Dehnung, die der beabsichtigten Aktivierung der Eingabeeinrichtung durch die Berührung zuzuschreiben ist, dies im Gegensatz zu der Spannung oder Dehnung, verursacht durch die Trägheit der Eingabeeinrichtung, wenn diese verlagert wird.

6. Datenverarbeitungssystem nach Anspruch 1, wobei der Berührungsschirm die nachfolgenden Elemente aufweist:

   - Gittermittel zum Erzeugen einer Gitters von Lichtstrahlen über und parallel zu der oberen Fläche;
   - Detektionsmittel zum beim Detektieren einer Unterbrechung wenigstens eines Lichstrahls verursacht durch die Berührung, Verarbeiten diesem bestimmten Strahl zugeordneter Daten als Anzeige einer Position der Unterbrechung.

7. Datenverarbeitungssystem nach Anspruch 1, 2, 3, 4, 5 oder 6, wobei das Digitalisierungstablett die nachfolgenden Elemente aufweist:

   - eine Widerstandsschicht;
   - Mittel zum Erzeugen eines zeitabhängigen elektromagnetischen Feldes über die Widerstandsschicht, wobei dieses elektromagnetische Feld eine Phse oder eine Amplitude hat, die abhängig ist von einer Position in dem Feld, wobei der Schreibstiftmit einem Detektor versehen ist, der empfindlich ist für das elektromagnetische Feld;
   - Verarbeitungsmittel, die mit dem genannten Detektor gekoppelt sind zum beim Detektieren des elektromagnetischen Feldes Bestimmen einer Lage des Schreibstiftes gegenüber der Eingabeeinrichtung.

8. Datenverarbeitungssystem nach Anspruch 1, 2, 3, 4, 5 oder 6, wobei das Digitalisierungsteblett die nachfolgenden Elemente aufweist:

   - eine Widerstandsschicht, wobei der Schreibstift mit einem Quellenmittel zum Induzieren von Strömen in der Widerstandsschicht versehen ist;
   - Abtastmittel zum Abtasten erzeugter ströme, die in zwei antiparallelen Richtungen über die Widerstandsschicht fließen;
   - Verarbeitungsmittel, die mit den Abtastmitteln oder beim Abtasten mit den erzeugten Strömen gekoppelt sind wobei eine Stelle des Schreib-

stiftes gegenüber der Eingabeeinrichtung bestimmt wird.

9. Datenverarbeitungssystem nach Anspruch 1, 2, 3, 4, 5 oder 6, wobei das Digitalisierungstablett die nachfolgenden Elemente aufweist:

   - eine erste Schicht mit einem ersten Satz von Leitern in einer ersten Orientierung;
   - eine zweite Schicht parallel zu der ersten Schicht, mit einem zweiten Satz von Leitern in einer zweiten Orientierung, die von dem ersten Satz elektrisch isoliert ist, wobei der Schreibstift mit Quellenmitteln versehen ist zum Erzeugen induktiver Ströme in den genannten Sätzen von Leitern;
   - Abtastmittel zum Abtasten der induktiven Ströme;
   - Verarbeitungsmittel, die mit den genannten Abtastmitteln gekoppelt sind zum Abtasten der induktiven Ströme, die eine Stelle des Schreibstiftes gegenüber der Eingabeeinrichtung bestimmen, und wobei die Datenwiedergabemittel eine passive, reflektierende Flüssigkristallwiedergabeanordnung aufweisen, wobei das Digitalisierungstablett unterhalb eines aktiven Teils der Flüssigkristallwiedergabeanordnung vorgesehen ist.

10. Datenverarbeitungssystem nach Anspruch 1, wobei die Eingabeeinrichtung mit Hilfe spannungs- oder dehnungsempfindlicher Elemente zum Detektieren einer auf die Eingabeeinrichtung ausgeübten externen Kraft aufgehängt ist, wobei Vergleichsmittel vorgesehen sind zum Vergleichen der ausgeübten Kraft mit einer vorbestimmten Schwelle, um im falle einer Übersteigung der Schwelle die Eingabeeinrichtung zu aktivieren.

11. Datenverarbeitungssystem nach Anspruch 1, wobei wenigstens der Berührungsschirm oder das Digitalisierungstablett elektrisch aktivierbar ist, wobei eine leitende Platte mit einem vorbestimmten Potential vorgesehen ist zum Schützen des Berührungsschirms oder des Digitalisierungstabletts vor elektromagnetischer Strahlung, die von der Steuerschaltung des Datenverarbeitungssystems herrührt.

12. Datenverarbeitungssystem nach Anspruch 1, dadurch gekennzeichnet, dass dieses System mit Maus-Mitteln versehen ist zum Wiedergeben eines Läufers, der über wenigstens den Berührungsschirm oder das Digitalisierungstablett betrieben werden soll, entweder dadurch, dass darauf gezeigt und an einer betreffenden Stelle Druck ausgeübt wird zur Neuplatzierung des Läufers oder dadurch, dass mit virtuellen "Klick"-Tasten auf eine segmentierte Kompass-Karte gezeigt wird, wobei ein Segment der Kompass-Karte indikativ ist für eine Richtung einer Bewegung des Läufers bei Aktivierung des Segmentes.

Revendications

1. Système de traitement de données comprenant un dispositif d'entrée, le dispositif d'entrée comprenant :

   un écran tactile pour entrer des données dans le système, l'écran tactile comprenant un support d'écran tactile et un premier détecteur sensible à un premier stimulus dans le support d'écran tactile, le premier stimulus étant représentatif d'un toucher ;
   une tablette graphique pour entrer des données dans le système au moyen de la manipulation d'un stylet à proximité de la tablette, la tablette graphique comprenant un support de tablette graphique et un deuxième détecteur sensible à un deuxième stimulus dans le support de tablette graphique, le deuxième stimulus étant représentatif de la présence du stylet ;
   ledit écran tactile et ladite tablette graphique étant intégrés avec un écran d'affichage, du fait qu'ils présentent des zones d'utilisateur se chevauchant dans une grande mesure,

   caractérisé en ce que lesdits premier et deuxième stimuli sont différenciables soit sur la base de leurs dimensions physiques réciproquement différentes soit sur la base de leurs plages de valeurs réciproquement disjointes,

   en ce que le support d'écran tactile est situé du côté utilisateur dudit écran d'affichage et ne connaît pas de sauts de transparence à travers sa zone utilisateur,
   en ce que le support de tablette graphique est soit situé du côté utilisateur dudit écran d'affichage et ne connaît pas de sauts de transparence à travers sa zone utilisateur,
   soit est situé en face du côté utilisateur dudit écran d'affichage,
   et en ce que le stylet intègre un capteur de pression pour, sous le contrôle d'une pression dépassant un seuil prédéterminé, permettre une coopération entre le stylet et le dispositif d'entrée.

2. Système de traitement de données suivant la revendication 1, dans lequel l'écran tactile comprend :

   - des moyens de source pour transmettre des ondes acoustiques de surface à travers le sup-

port d'écran tactile ;
- des moyens de réception pour recevoir les ondes acoustiques de surface ;
- des moyens de traitement couplés aux moyens de réception pour, sur la base d'une absorption des ondes acoustiques de surface dans le support d'écran tactile, déterminer la présence et l'emplacement de l'absorption provoquée par le toucher.

3. Système de traitement de données suivant la revendication 1, dans lequel l'écran tactile comprend :

- une couche résistive ;
- des moyens pour déterminer l'emplacement d'un couplage capacitif entre la couche résistive et la masse tel que provoqué par le toucher.

4. Système de traitement de données suivant la revendication 1, dans lequel l'écran tactile comprend :

- une surface rigide couplée à un cadre rigide au moyen d'éléments sensibles à la tension ou à la contrainte ;
- des moyens pour, lors de la surveillance de la tension ou de la contrainte dans les éléments, déterminer si une force externe est appliquée à la surface rigide par le toucher, et où.

5. Système de traitement de données suivant la revendication 4, dans lequel des moyens de filtre sont prévus pour distinguer la tension ou la contrainte qui est due à l'activation prévue du dispositif d'entrée par le toucher par opposition à la tension ou contrainte due à l'inertie du dispositif d'entrée lorsque celui-ci est déplacé.

6. Système de traitement de données suivant la revendication 1, dans lequel l'écran tactile comprend :

- des moyens de grille pour générer une grille de faisceaux lumineux au-dessus et parallèlement à la surface supérieure ;
- des moyens de détection pour, lors de la détection d'une obstruction d'au moins un faisceau lumineux provoquée par le toucher, traiter les données associées au faisceau particulier comme indication d'une position de l'obstruction.

7. Système de traitement de données suivant la revendication 1, 2, 3, 4, 5 ou 6, dans lequel la tablette graphique comprend :

- une couche résistive ;
- des moyens pour établir un champ électromagnétique à dépendance temporelle à travers la couche résistive, lequel champ électromagnétique présente une phase ou amplitude qui dépend d'une position dans le champ, le stylet étant pourvu d'un détecteur sensible au champ électromagnétique ;
- des moyens de traitement couplés audit détecteur pour, lors de la détection du champ électromagnétique, déterminer une position du stylet par rapport au dispositif d'entrée.

8. Système de traitement de données suivant la revendication 1,2, 3, 4, 5 ou 6, dans lequel la tablette graphique comprend :

- une couche résistive, le stylet étant pourvu de moyens de source pour induire des courants dans la couche résistive ;
- des moyens de détection pour détecter des courants agrégés circulant dans deux directions antiparallèles à travers la couche résistive ;
- des moyens de traitement couplés aux moyens de détection pour, lors de la détection des courants agrégés, déterminer la position du stylet par rapport au dispositif d'entrée.

9. Système de traitement de données suivant la revendication 1, 2, 3, 4, 5 ou 6, dans lequel la tablette graphique comprend :

- une première couche comprenant un premier jeu de conducteurs selon une première orientation ;
- une deuxième couche parallèle à la première couche, comprenant un deuxième jeu de conducteurs, selon une deuxième orientation, électriquement isolé du premier jeu, le stylet étant pourvu de moyens de source pour générer des courants inductifs dans lesdits jeux de conducteurs ;
- des moyens de détection pour détecter les courants inductifs ;
- des moyens de traitement couplés auxdits moyens de détection pour détecter les courants inductifs déterminant la position du stylet par rapport au dispositif d'entrée, et dans lequel les moyens d'affichage de données comprennent un affichage à cristaux liquides à réflexion passif, la tablette graphique étant disposée en dessous d'une partie active de l'affichage à cristaux liquides.

10. Système de traitement de données suivant la revendication 1, le dispositif d'entrée étant suspendu au moyen d'éléments sensibles à la tension ou à la contrainte pour détecter une force externe appliquée au dispositif d'entrée, des moyens de comparaison étant prévus pour comparer la force appliquée à un seuil prédéterminé pour, dans le cas du

dépassement du seuil, activer le dispositif d'entrée.

11. Système de traitement de données suivant la revendication 1, dans lequel au moins l'écran tactile ou la tablette graphique peut être activé électriquement ; une feuille conductrice étant prévue à un potentiel prédéterminé pour protéger l'écran tactile ou la tablette graphique d'un rayonnement électromagnétique provenant des circuits de commande du système de traitement de données.

12. Système de traitement de données suivant la revendication 1, caractérisé en ce que le système de traitement de données est pourvu de moyens de souris pour afficher un curseur à actionner par l'intermédiaire au moins de l'écran tactile ou de la tablette graphique, soit en pointant et en appuyant sur un emplacement approprié pour repositionner le curseur soit en pointant sur une rose des vents segmentée avec des boutons "à positions encliquetées" virtuels, un segment de la rose des vents indiquant une direction de mouvement du curseur lors de l'activation du segment.

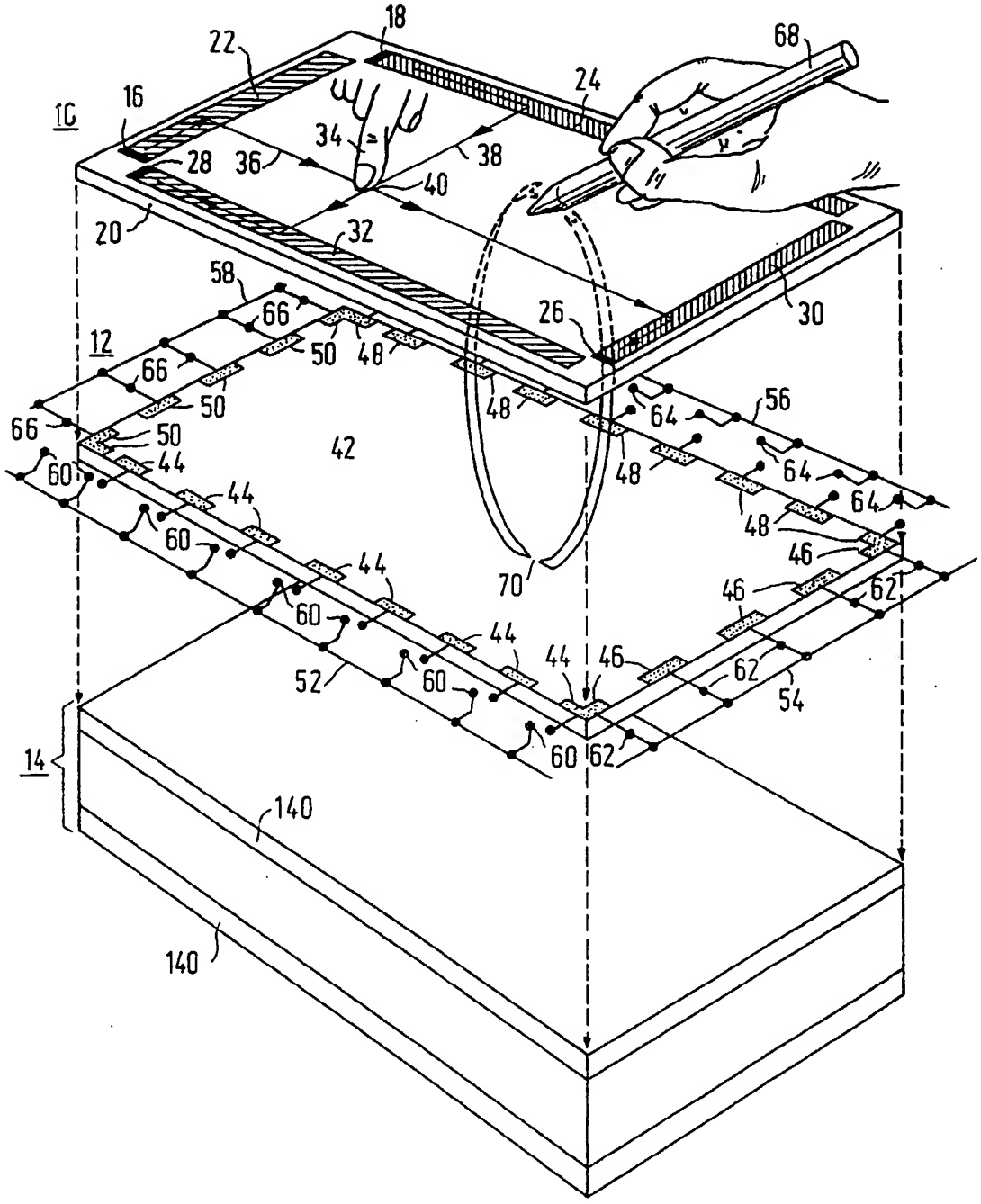
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
140
140

FIG. 1

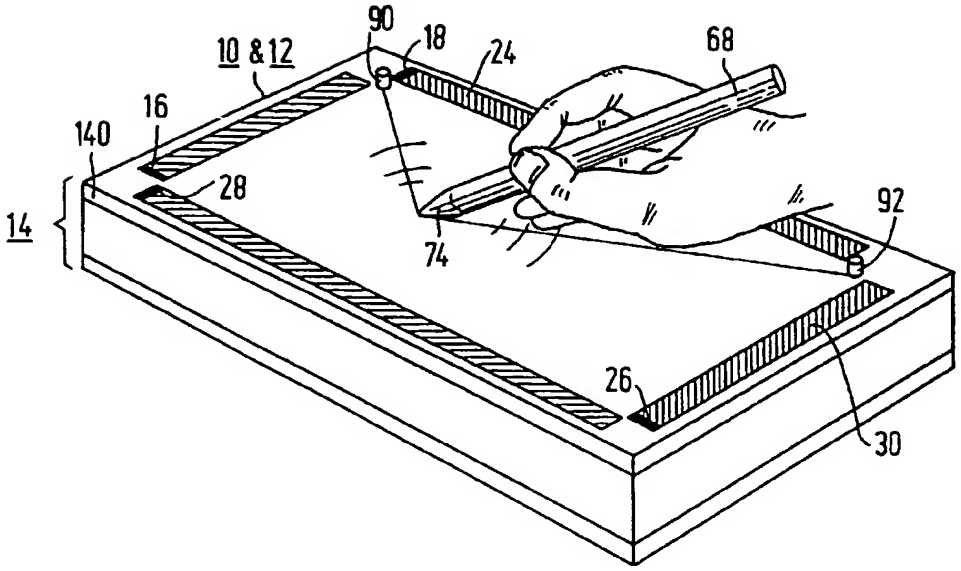
90
18
24
68
10 & 12
16
140
28
14
74
92
26
30

FIG. 2

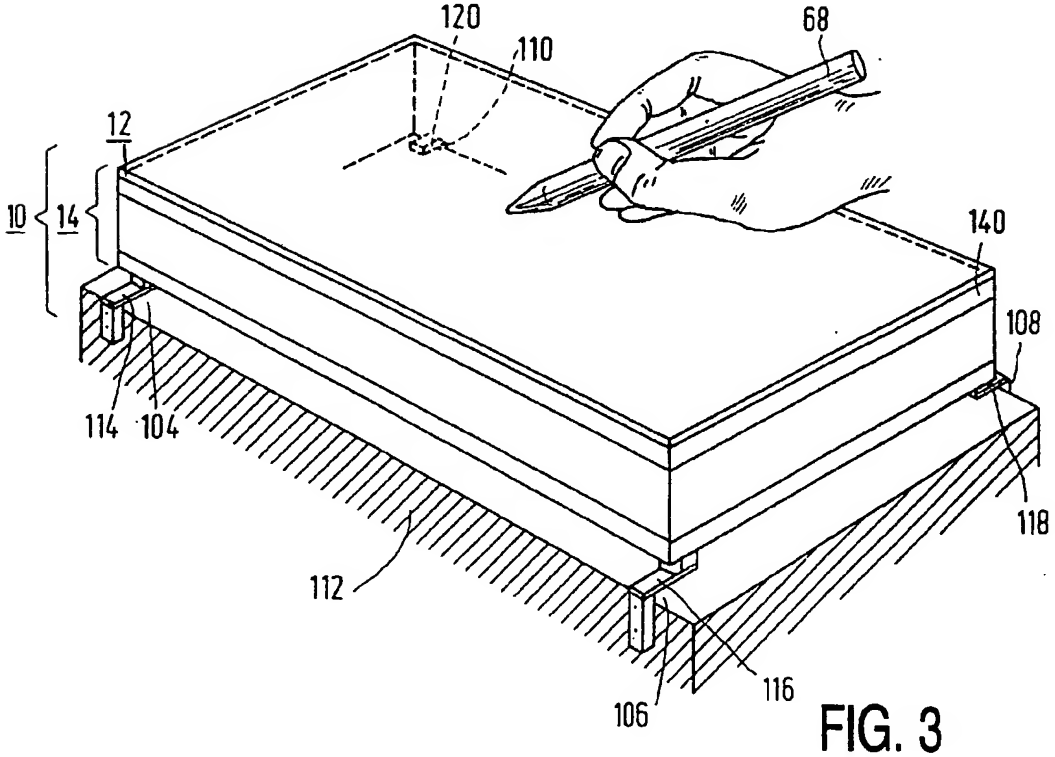
120
110
68
12
10
14
140
108
114
104
118
112
116
106

FIG. 3

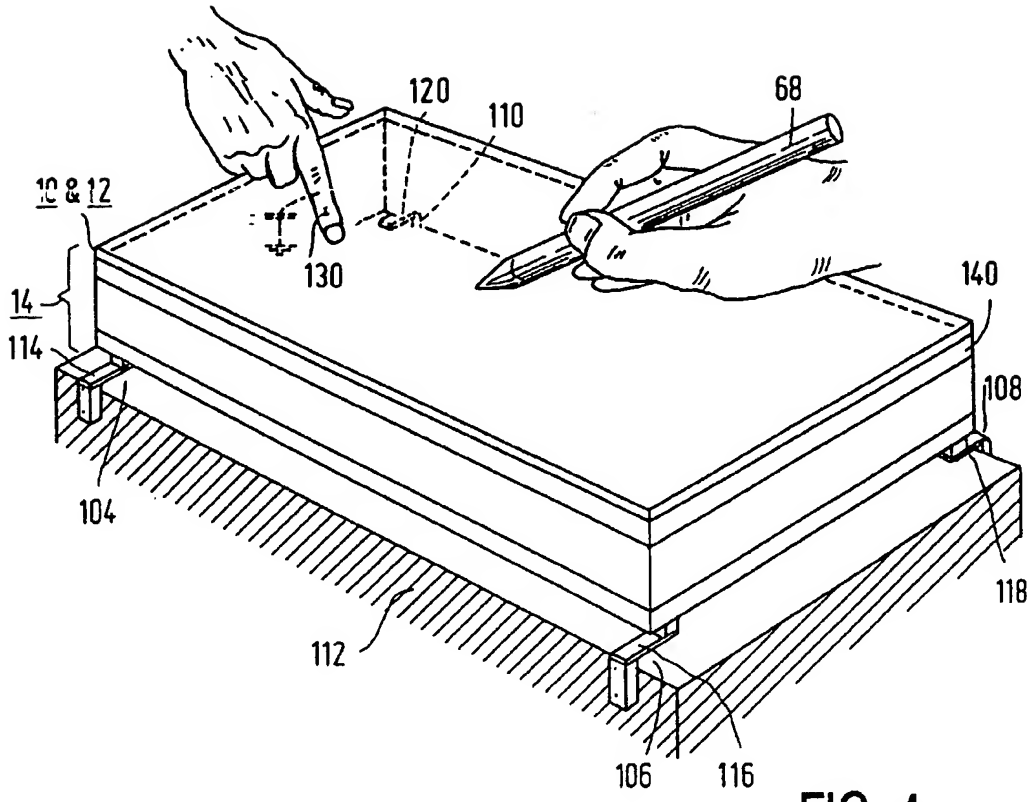
120
110
68
10 & 12
130
140
14
114
108
104
118
112
106
116

FIG. 4

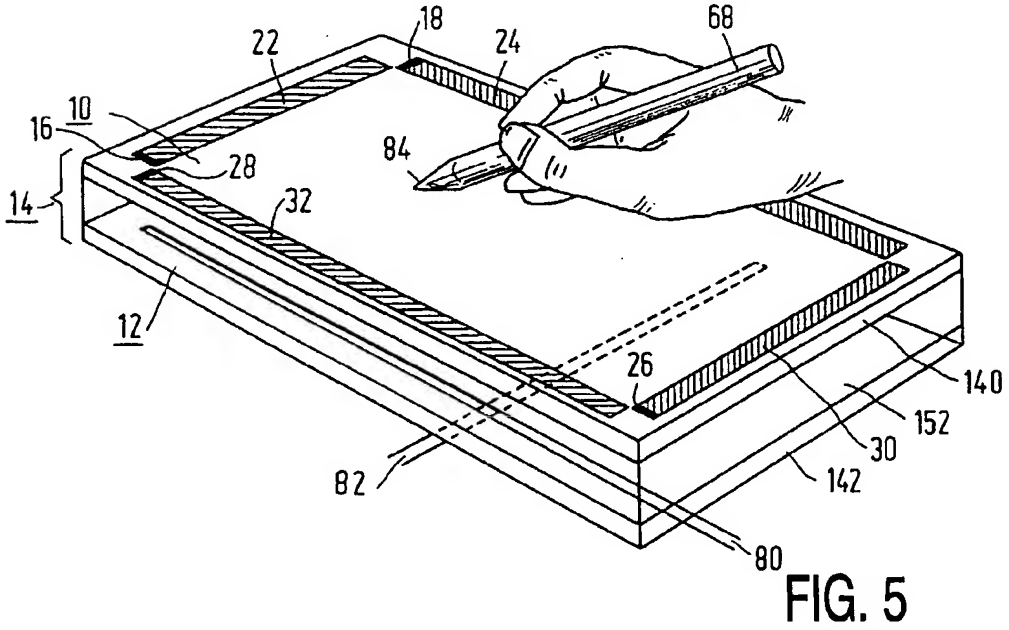
18
22
24
68
16
10
84
28
14
32
12
26
140
152
30
142
82
80

FIG. 5